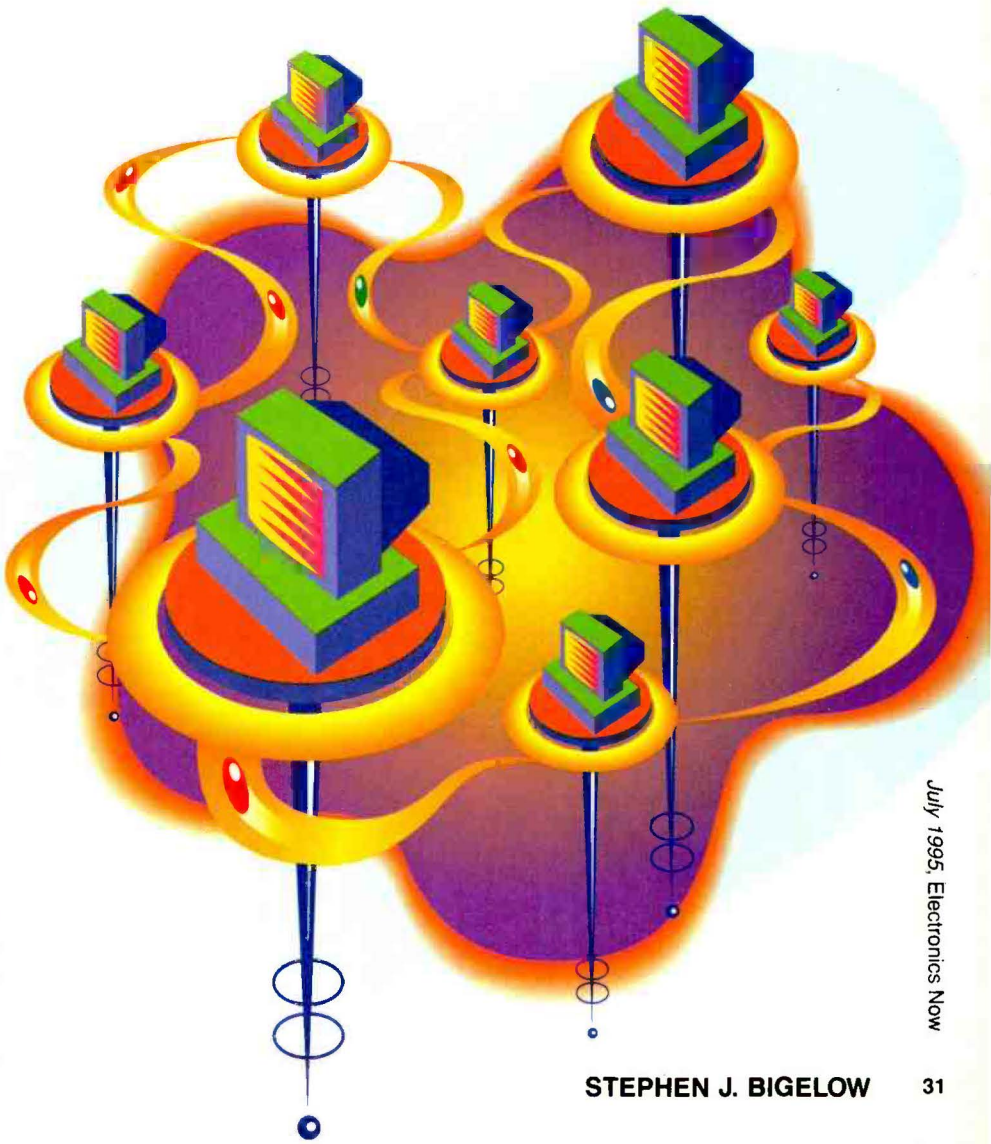
Getting Connected to the Internet

The Internet is growing at an phenominal rate. Isn't it time you got connected?



THE INTERNET, LITTLE MORE THAN an academic network only a few years ago, is quickly becoming a global information resource for both companies and individuals. With the explosive growth of Internet service providers and bundled packages of software and documentation, getting online is now faster and easier than ever before. This article takes you inside of the Internet, shows you how to go online, and explains the tools you need to take full advantage of what the Internet has to offer.

The Internet began as a government networking experiment in the late 1960s and has quickly evolved into a complex series of networks that extends around the world. With thousands of university, government, and private industry networks already joined together, the Internet represents an unprecedented information resource for individual computer users and businesses of all sizes. According to The Internet Society, there are already 30 million or more active Internet users—a number that is swelling by 160,000 users each month.

What is the Internet?

Expressed simply—perhaps over simplified—the Internet is nothing more than a network of networks. The individual networks that make up the Internet are owned and operated by their particular university or research center, so no one really "owns" the Internet. There is no centralized authority or administration as there is with commercial online services such as CompuServe or America

STEPHEN J. BIGELOW

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Online. Each network is totally independent.

This independence is the main reason why the Internet is so unregulated and why individual users and ordinary businesses have had so much trouble getting connected until recently. It's also the reason why the Internet can be so overwhelming to new users. The Internet offers access to thousands of networks, but unless you know what you are looking for and where it is located, you'll never find it unless you stumble upon it. New users often feel as if they're afloat on a sea of information without a compass.

The Internet had its start in the early 1970s, when the US Defense Department wanted to build a computer network that would link its network, called ARPAnet, to other radio and satellite networks. The network was intended primarily to support military research.

One of the important elements of the network design was that it had to be reliable even if its individual components weren't—for example, it had to work even in the event of a nuclear war.

Since reliability was essential, communication was intended to take place between two computers directly, without regard to the path between them. Any portion of the network could be disabled, and communication would assume one of several alternative paths to the destination. The message being sent was enclosed in a standardized "envelope" known as an internet-protocol (IP) packet. Each IP packet contained the "address" of the destination machine.

The ARPAnet project continued into the early 1980s along with the development of local-area networks (LANs). Most LAN workstations in the early 1980s ran the Unix operating system which had IP networking built-in. Organizations with their own LANs preferred to connect to the ARPAnet rather than a single time-sharing computer at their own location. Since Unix supported IP communication, a connection proved rather straightforward, although using the system on the ARPAnet required proficiency with Unix.

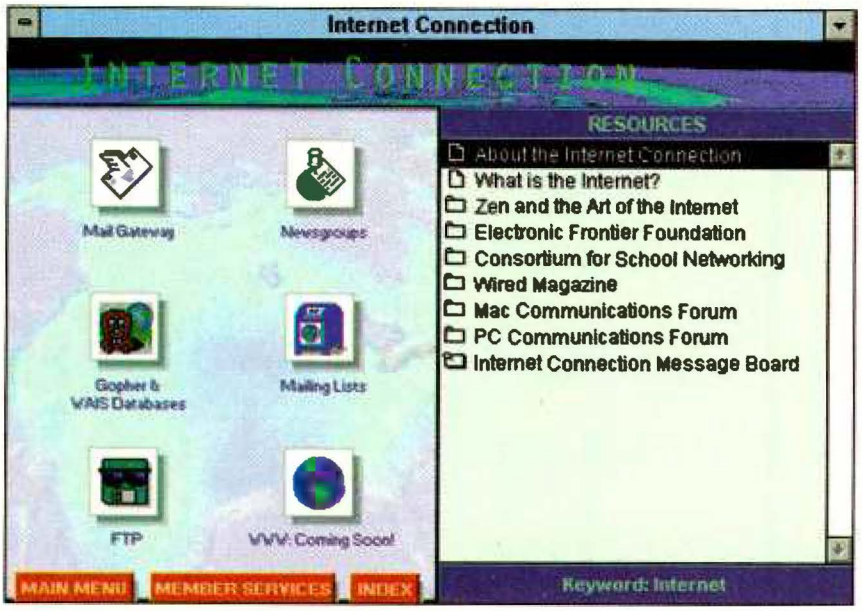
By the late 1980s, the National Science Foundation (NSF) built its own network (called NSFNET) which was based on ARPAnet's IP communication technology. NSFNET was designed to support five supercomputer centers located around the country. The intent was to make supercomputing resources—which previously had been available to only a few— available for university research.

All five supercomputer centers needed to be connected together, and all of the universities had to be connected to the centers as well. It would have been prohibitively expensive to connect each university to the NSFNET directly because of the cost of the required dedicated telephone lines. Instead, the NSF created regional networks which allowed each site to be connected in a daisy chain fashion, as well as allow connections for local clients. Thus, messages could be exchanged from computer to computer by passing messages back and forth along the daisy chain. This architecture was the forerunner of what we know as the Internet.

By the late 1980s, the NSFNET became overloaded. Merit Network, Inc. upgraded the NSF network and opened access to academic researchers, government organizations, and contractors. Access was also extended to other countries allied to the United States.

Today, the network built by the NSF forms the backbone of the Internet. But that backbone is joined by over 5000 regional, state, campus, and corporate networks. Links to Canada, Europe, Japan, Australia, Central America, and South America are now operational.

Like all government works, use of the Internet for "personal gain" has largely been prohibited. However, commercial organizations see the Internet as a very viable outlet for selling goods and services. By 1992, restrictions on the commercial use of the Internet were revoked. Today, there are actually more commercial sites using the Internet than educational and research organizations. That trend will almost certainly continue as more users and businesses come online.



AMERICA ONLINE'S MAIN Internet-services menu. AOL's Internet offerings have fallen behind some of the other major online services.

Why use the Internet?

The size and scope of the Internet is truly impressive, but what's in it for you? The Inter-

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net's resources are staggering but, unless you have a specific need, there is a great deal of information that you will probably never use. However, there are four compelling activities that virtually any reader of *Electronics Now* can benefit from: E-mail, Usenet news, file transfers, and information browsing.

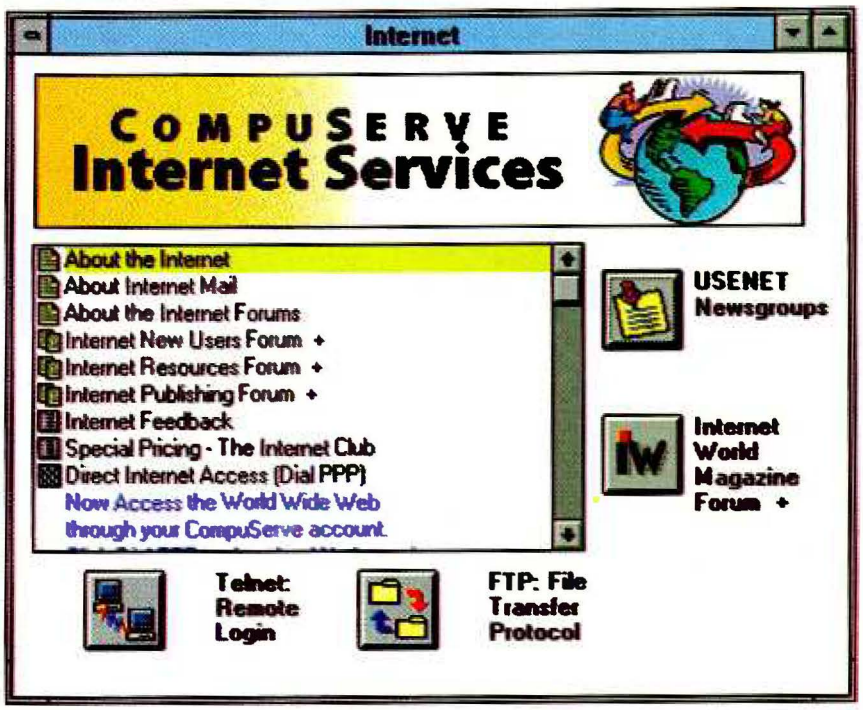
E-mail. Electronic mail or E-mail allows you to exchange messages with anyone on the Internet. That includes any system with an Internet gateway, such as CompuServe, America Online, and even many computer bulletin-board systems (BBS). E-mail is typically much faster—and generally much cheaper—than traditional mail.

Many manufacturers are starting to use the Internet as the forum of choice for national and international tech-support. As a result, your product questions and problems can typically be answered with less frustration from "time-on-hold" on a telephone call. There is little doubt that "live" tech-support is fading fast as manufacturers try to reduce their load of clogged telephone lines.

Usenet newsgroups. There is an incredible variety of electronic discussion groups (or Usenet news groups) available on the Internet. Topics range from the mundane to the bizarre. By "subscribing" to each news group of interest, you can stay in touch with the very latest discussions, opinions, and happenings.

An alternative to the news group is the mail list which echoes copies of pertinent E-mail to all members of the particular list(s). This allows you to keep abreast of the latest news and information in areas that interest you. Like news groups, there are a wide variety of mail lists available on the Internet.

File transfer There is a multitude of files and utilities available on the Internet in the form of shareware and freeware. Using file transfer protocol (FTP) utilities, you are able to retrieve or upload files from a computer in Tokyo as easily as you could from a computer in the next room or down the street—it really doesn't matter where the other computer is located.



COMPUSERVE'S INTERNET ACCESS menu. Compuserve is becoming more aggressive in its Internet services.

Information. As an Internet user, you will find everything from weather reports and space photographs to government databases. Traditionally, the problem has been knowing what's available and knowing where to find it. There are few accurate guides to Internet resources—there is simply too much change and growth.

Fortunately, there are a growing number of utilities that make it possible to navigate easily through Internet resources in order to find what is available. Browsing tools allow you to traverse from system to system and review their offerings in a matter of moments.

How to Connect

Connecting to the Internet has always been somewhat of a chore. This was due in part to the lack of central authority, and in part to the lack of personal computers powerful enough to interact with the Internet effectively. Only a few years ago, getting an Internet account was a matter of who you knew. It typically required a mainframe and network at a university or research organization before an Internet connection could be established. Then, individual accounts were distributed as needed to students, educators, researchers - whoever had a good reason to be online.

Even as PCs and operating systems became powerful enough to "stand alone" on Internet, the problem was where to connect. This later problem has largely been resolved by the growth of local Internet service providers who have their networks connected to the Internet, and sell access on their networks to individuals, businesses, and other networks.

You can't simply splice a cable and wind up with Internet access. An Internet service provider therefore becomes a valuable friend and ally. Remember that the Internet is not centrally managed, so there is no one place you can go to sign up. A service provider is a company which owns and operates a network which has assess to the Internet. In turn, the service provider can supply you with several types of connections. The service provider charges you a fee for your connection

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(telephone line charges are separate), and a portion of those proceeds go to support the Internet as a whole.

It is important for you to remember that not all service providers are created equal. The quality, cost, and reliability of their services can vary radically between providers. Some service providers offer regional coverage, while others offer national support. Many provide service for only a local area. Since all providers are owned and managed independently, any individual provider might not suit your needs. Some are simply better than others.

Your best course is to shop around and compare the deals offered by each provider. Although some people feel more secure with a large, established national service provider, others like the cost benefits and customer service that local providers are known for.

Today, a service provider can offer three typical paths to the Internet; the direct connection, the dial-in connection, and the online service. Each path carries its share of requirements and costs, so consider your needs before proceeding.

Direct connection. A direct connection is clearly the most powerful and expensive form of Internet connection. In effect, you must have (or be part of) a network. You will then need a dedicated telephone line such as a 56 kilobit per second (kbps) line, or a T1 (1.5 megabits per second) line. You'll also need special hardware and software (typically purchased or leased from your service provider) to support your connection to the service provider.

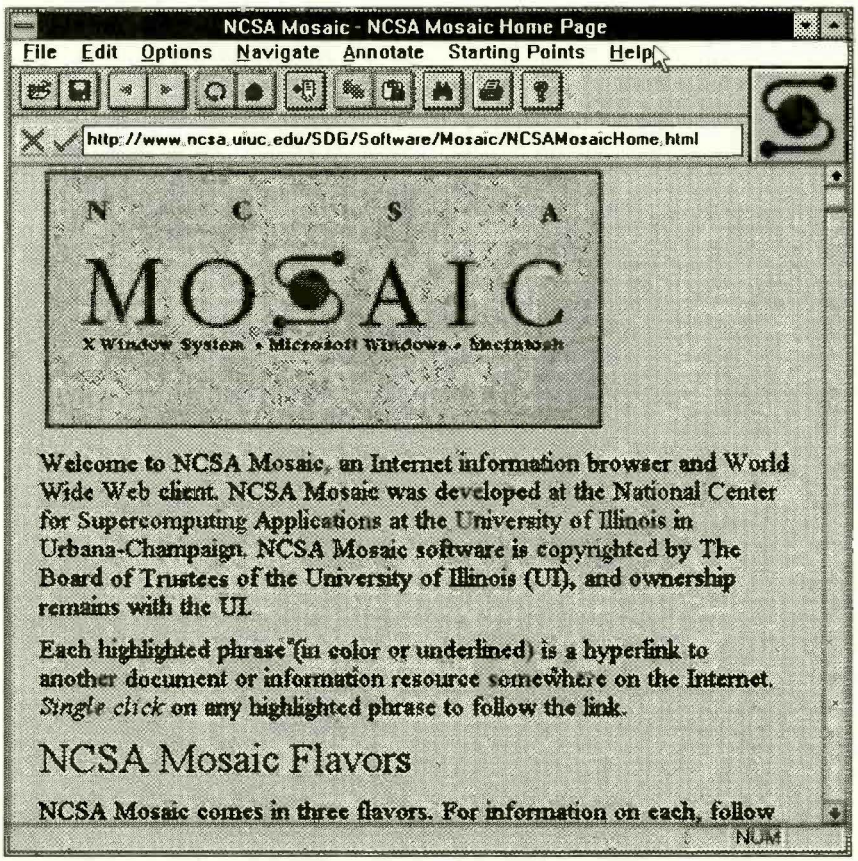
A direct connection offers some distinct advantages. For example, you can set up an FTP server which allows outside individuals and organizations to access your systems. In effect, you become a tangible new part of the Internet. Commercial organizations moving to do business on the Internet often take advantage of that capability. Next, a direct connection keeps you permanently online. And third, at 56 kbps or faster, file transfers will be accomplished much faster than with a standard dial-up line.

Unfortunately, the direct connection carries a substantial cost. A dedicated connection can easily cost an organization $15,000 to $20,000 or more in the first year, and a bit less each subsequent year. A direct connection is reserved for organizations which need and can afford them.

Dial-in connection. As an alternative to direct connections, most service providers offer dial-in (or dial-up) connections. The dial-in connection is a medium-performance connection which requires only a PC and a modem. In general, the faster the modem, the better. The dial-in account works much like other standard online services: you dial a number to your service provider, establish a modem connection, and enjoy your Internet access.

The dial-in connection can offer varying degrees of access. Many providers offer a Unix shell account, which might give menu access to E-mail and newsgroups. Others might provide FTP and Telnet capability.

Another kind of dial-in connection is the SLIP or PPP account, which requires that you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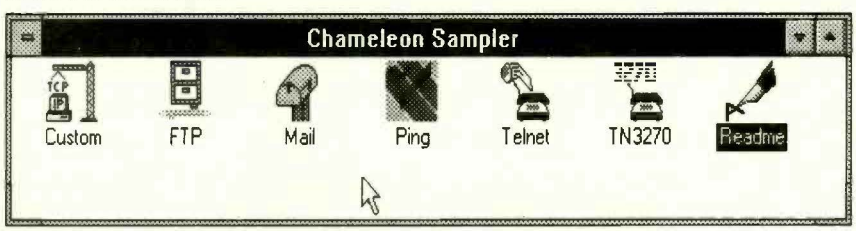
N C S A
MOSAIC
X Window System • Microsoft Windows • Macintosh
Welcome to NCSA Mosaic, an Internet information browser and World Wide Web client. NCSA Mosaic was developed at the National Center for Supercomputing Applications at the University of Illinois in Urbana-Champaign. NCSA Mosaic software is copyrighted by The Board of Trustees of the University of Illinois (UI), and ownership remains with the UI.
Each highlighted phrase (in color or underlined) is a hyperlink to another document or information resource somewhere on the Internet. Single click on any highlighted phrase to follow the link.
NCSA Mosaic Flavors
NCSA Mosaic comes in three flavors. For information on each, follow
NUM

THE WORLD WIDE WEB, with its grapical capabilities, is generating a lot of excitement on the Internet. A web browser, such as Mosaic shown here, provides point-and click access to information.



THE CHAMELION SAMPLER packaged with the Internet Membership Kit contains the most important applications you'll need online.

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run software and TCP/IP drivers on your PC to match the connection type.

SLIP and PPP connections provide virtually all of the capabilities that a direct connection would, because, in essence, the connection puts your computer directly on the Internet. (With a Unix shell account, your computer is acting as a terminal of a computer that is on the Internet.) With a SLIP or PPP account, your connection is active only while the modem connection is established. Thus, the cost is only a per-hour connect fee (usually under $100 for 80 hours/month of service). If you are making a toll call for access, you can expect to pay a toll fee as well. Even with toll charges, a dial-in connection is the preferred type of Internet access for individuals and many small-businesses.

Most service providers can easily support SLIP accounts, and much of the bundled software out there is written for SLIP operation. PPP is a slightly newer and more effective protocol, but fewer service providers support it, and less of the available software is designed to take advantage of it.

Dial-in connections are greatly simplified by the trend toward "bundling" Internet access software and TCP/IP drivers with reference books. There are a number of good starter bundles out there; the one discussed here is the *Internet Membership Kit* from Ventana Press. Although its Chameleon Sampler software was not the simplest software to configure, it has everything needed to go online.

Even if you choose to buy a different bundle, the requirements and the process is generally the same. The PC itself should be based on a 386 or faster CPU, and it should have four megabytes or more of RAM, DOS 5.0 or later, Windows 3.1 or later, and at least 10MB of available hard drive space.

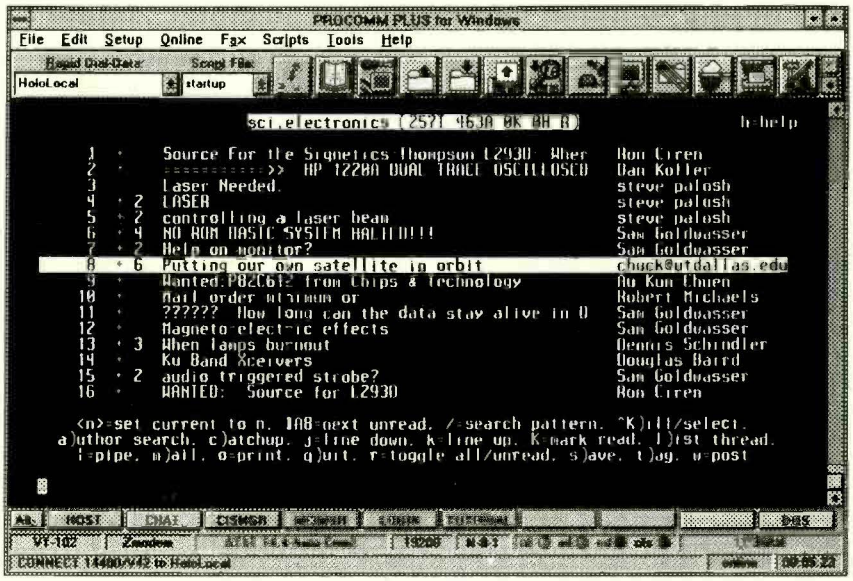
The steps to getting connected are:

1) Install the bundled software under Windows.

2) Choose a service provider—publishers that bundle books and software generally strike excellent deals with national service providers.

3) Call the chosen provider by phone or BBS to establish the account.

4) Wait a day or two for the ac-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4 2 LASER steve palosh
5 2 controlling a laser beam steve palosh
6 4 NO ROM BASIC SYSTEM HALTED!!! Sam Goldwasser
7 2 Help on monitor? Sam Goldwasser
8 6 Putting our own satellite in orbit chuck@utdallas.edu
9 Wanted:P82C612 from Chips & Technology Au Kun Chuen
10 Mail order minimum or Robert Michaels
11 ?????? How long can the data stay alive in D Sam Goldwasser
12 Magneto-electric effects Sam Goldwasser
13 3 When lamps burnout Dennis Schindler
14 Ku Band Xceivers Douglas Barrd
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HOST
DIAL
VT-102
CONNECT 14400/V42 to HoloLocal

A GRAPHICAL INTERFACE is not required to get what's really important—information—from the internet.

INTERNET GLOSSARY

Archie—A system used for locating files stored on FTP servers.

Backbone—The main supporting network infrastructure which composes the Internet.

Finger—A software feature used to determine if another particular user is logged onto the Internet, and can be used to find E-mail addresses.

FTP (File Transfer Protocol)—A protocol that describes the transfer of files between a host and remote computer.

Gopher—An Internet search tool (a "browser") that presents information as a hierarchy of menus or table of contents.

IP (Internet Protocol)—A standard protocol that describes how packets of data are transported across the Internet and interpreted as a message.

News group—A forum or conference area (similar to a BBS or other online service) where you can post messages on a specific topic.

NNTP (Network News Transport Protocol)—An extension of TCP/IP which describes how news group messages are transported between various compatible servers.

PING (Packet Internet Gopher)—A TCP/IP utility that simply sends packets of information to another computer on the Internet - this can be used to determine if a certain computer is connected.

Protocol—A set of rules or standards that describe operational characteristics.

Router—A combination of hardware and software that directs messages between LANs.

SLIP/PPP (Serial Line IP/Point-to-Point Protocol)—Two popular protocols that allow dial-in access to the Internet through a serial (modem) link.

SMTP (Simple Mail Transfer Protocol)—The TCP/IP protocol that defines how E-mail moves between host and user systems.

TCP/IP (Transmission Control Protocol/Internet Protocol)—A complete combination of network and transport protocols that allow a PC to interact with other PCs or networks on the Internet.

Telnet—A terminal emulation program that allows you to access other computers on the Internet in an interactive fashion.

Usenet—The full complement of news groups available on the Internet.

Veronica—A browsing tool (similar to Archie or Gohper) that searches the text appearing in Gopher menus.

WAIS (Wide Area Information Server)—Software to index large text files. It also finds and retrieves documents based on user-defined keywords.

WHOIS—A TCP/IP utility that allows you query various servers about other Internet users.

Winsock (Windows Socket)—A Windows API that lets Windows applications run on a TCP/IP network.

WWW (World-Wide Web)—A network of servers using hypertext links to find and access files - many servers offer sound and video support.

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count to be activated.
5) Configure the bundled software and start your access.

Once you are finally online, you can download (or "FTP") additional shareware or freeware utilities which offer even better mail, news, or browsing capabilities.

Online services

Of course, there are quite a few readers who don't need or want all of the services offered on the Internet. An online service such as CompuServe, America Online, or Delphi already serves most of their needs. If you already subscribe to an online service or high-end bulletin board service (BBS), you also have limited access to the Internet—the number and quality of the services that are offered depend on the particular service, and the price varies as well. Contact the customer service department of your preferred online service for a breakdown of their available Internet services.

Addressing and naming

Of all the subtle complexities of the Internet, few evoke more frustration and confusion among new users than naming conventions. On the surface, that collection of numbers and nonsense words may seem arcane or even random. But there is a method to the madness.

Each computer connected to the Internet has two addresses; an IP address, and a domain name. The IP address is a series of four numbers (each less than 256) which are separated by periods. For example, a typical IP address might look like; 134.84.101.1. For the most part, you do not have to concern yourself with remembering IP addresses—just the domain name.

There are actually several types of names involved in the naming process; the user name, the domain name, and the top domain name. The user name is the alphanumeric string that identifies you as an individual. A user name can be completely arcane (such as axc13ex), but if you are in a position to choose your own user name, pick one that will be meaningful to you and the people who will be sending you E-mail. For example, my user name, sbigelow, is based on my real name.

The domain name generally refers to the supporting network (or service provider) that your computer is connected to, and is separated into two parts; the domain name itself, followed by a three-character top domain name. For my account, the domain name would be cerfnet, and the top domain would be com. Taken together, my Internet name is sbigelow@cerfnet.com - pronounced "s-bigelow at surf-net dot com." Feel free to send me some E-mail when you get online.

Of course, the names mentioned so far are pretty simple. What happens with a address like: j—jones@rabbit.oit.unc.edu? Well, reading the address gets a bit more complicated, but the basic rules are the same. First, the user name (j—jones) is easy enough to find. The term right after the @ symbol is the computer's name (rabbit), and the top domain name (edu) identifies the address as an educational institution. The string "oit" represents Office of Information and Technology, while the string "unc" indicates the University of North Carolina. Unfortunately, you might not know that by simply looking at the symbols. What this means for you is that not all addresses are self-explanatory.

You can tell a bit about the type of domain from looking at the top domain name. The three character code explains what type of organization the domain represents. There are six top domain names that are generally used in the United States:
com—a commercial business or organization
edu—an educational institution such as a college or university
gov—a government department or organization
mil—a military installation or organization
net—network resources - an integral part of the Internet infrastructure
org—typically a non-profit or other organization

For users outside of the US, the top domain name is a two character country code. Such geographic addressing is also used in the U.S., in which case an address might look something like: user@well.sf.ca.us.

Tools of the trade

Once you are finally online with a dedicated or dial-in connection, you will be faced with the challenges of exploring the Internet. Over the years, a variety of tools have developed to serve each individual function. Let's assume that you're an individual user who has purchased bundled software and documentation.

The tools that come with your bundled software are certainly useful and functional, but few packages contain the full-blown versions of those tools. This means that while you'll be able to perform a variety of functions, you probably can not take full advantage of the Internet. At the very least, a bundled software package will offer five working areas;

The TCP/IP stack. This is a vital background utility which allows your Windows PC to communicate with your service provider through standard TCP/IP. The TCP/IP stack is typically loaded before dialing your service provider, and unloads after the connection is severed. Without this function, your individual dial-in connection would not work.

E-mail utility. Virtually all bundled Internet software offers an E-mail utility which allows you to retrieve and create your own E-mail. Mail utilities vary in quality and efficiency, but they get the job done.

FTP utility. Part of the power of the Internet is your ability to get into other computers around the world to upload or download files. Software bundles typically provide a basic FTP utility. Using FTP, you can download articles, electronic books, and other more powerful Internet utilities.

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GETTING CONNECTED

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Telnet utility. While an FTP function merely gives you access to another computer's directories and files, Telnet actually allows you to work with other computers in an interactive fashion through a command-line interface. You can still upload and download files.

Power Tools

While bundled software will get you onto the Internet, it will only take you just so far. Fortunately, there are many more shareware and freeware programs that will make it easier for you to take advantage of Internet resources. The programs listed below are all available right off the Internet. Locations where they can be contained are listed for your convenience.

Eudora. This is one of the best Internet E-mail programs available. If you find yourself handling a great deal of E-mail, consider downloading the freeware version of Eudora by FTP from ftp.qualcomm.com in the /pceudora/windows/ directory.

Gopher. Tools such as E-mail and FTP utilities are great for specific tasks, but the vast majority of Internet resources are buried under layers of networks and directories; Moving from one place to another can be a long, arduous task. What is needed is a "browser" that lets you move from one place to another as efficiently as possible. The Gopher tool is perhaps the most effective browser for the Internet. You can find a freeware copy of Gopher by FTP from lister.cc.ic.ac.uk in the /pub/wingopher/ directory.

Trumpet. Another feature of the Internet is the availability of Usenet news groups. Basically, network news groups are electronic discussion areas where people can post questions and exchange information. To subscribe to and participate in news groups, you will need a news reader utility such as Trumpet. Trumpet is available as shareware ($40), and be downloaded by FTP from ftp.utas.edu.au in the /pc/trumpet/wintrump/ directory.

Mosaic One of the most exciting developments on the Internet is the World Wide Web (WWW) which offers a vast array of documents combining text, images, sound, and video. Mosaic is a tool designed to browse the WWW - it also provides limited FTP, news, and Gopher services. Mosaic is freeware available by FTP from ftp.ncsa.uluc.edu.

Getting connected to the Internet is only the first step to a world of information. Once you're connected, you'll find such a wealth of information that your only problem will be sifting through it. Ω

SMART DISPLAYS

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pletely. Listing 6 and Figs.8 and 9 explain how this is done. The first line of code sets integer udc—ram equal to 28H, (equal to binary 101000). This initial value is required to access the UDC RAM. Then hex 28H is sent to port B. That sets $\overline{FL}$ and A3 to 1, while also setting A4 to 0. Display lines A2 to A0 correspond to the row number of data to be loaded into the UDC RAM location now being accessed. Row 1 equals binary 000, and row 7 equals binary 110.

The $\overline{WR}$ and $\overline{CE}$ lines are then toggled to 0, and the first row of UDC data is loaded into the UDC RAM location. If dot—data equals 0, the first row is loaded. If dot—date equals 1, the second row is loaded and so on. This step is performed by display data lines D4 to D0. All other display lines are ignored. Finally, disable the display write, jump to a new UDC RAM location, and repeat the write process seven times.

To display the UDC symbol that was defined, recall in the discussion of the character RAM that it stores either ASCII character data or a user-defined character (UDC) address in each character RAM location. Those UDC RAM addresses correspond to all of the 16 UDC addresses shown in Fig. 2.

Refer to the end of Listing 6. To access the symbols created, access the character RAM by setting $\overline{FL}$ and A4 to A3 to 1, while setting A2 to A0 to the digit location where the UDC symbol is to be displayed. Toggle the lines to perform a write, and then insert the location of the ADC symbol in the ADC RAM. Set display data line D7 to 1, and lines D3 to D0 to the ADC RAM location where the symbol is stored.

Projects and source code

This project offers an opportunity for self-teaching the fundamentals of interfacing a personal computer with exterior circuits and devices, a subject not now covered in textbooks. You are encouraged to experiment with making the display scroll forward and backward, or even getting it to scroll vertically with the UDC functions. You can access the display self-test function, or you might want to build a computer driven moving message panel.

If you want to write and improve source code, you might want to purchase the author's source code diskette listed in the Parts List. It contains the complete listings of all code used in this article and also has a menu-driven executable program that goes beyond the examples given here (source code included). In addition, a second executable program allows special messages to be typed into the display (source code included).

The port address selector circuit gives you a way to send digital code to circuits or devices outside of your computer system. This circuit can be used to control or troubleshoot many different kinds of digital logic. For example, you could write data to your display and then read it back into your computer through the Port Address Selector. Ω

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